

## CLAIMS

### 1. An image display apparatus comprising

an image display device for demonstrating an image;

a relaying optical system for relaying image light of said image demonstrated on said image display device;

a prism at least including a first planar optical surface, a second planar optical surface arranged substantially parallel to said first planar optical surface on a side towards an optical pupil, an incident planar optical surface which has an optical axis including an angle of not less than 30 degrees and less than 90 degrees with a normal to said first planar optical surface or to the second planar optical surface and on which is incident said image light relayed by said relaying optical system, and a reflective transmitting surface having a preset tilt relative to said first planar optical surface or said second planar optical surface and adapted for reflecting or transmitting said image light incident thereon from said incident optical surface;

a reflective optical component arranged on a side towards said first planar optical surface of said prism and configured for reflecting said image light reflected on said reflective transmitting surface and radiated from said first planar optical surface towards said reflective transmitting surface as a substantially collimated light beam; and

a phase difference optical component arranged on a light path of said first planar optical surface of said prism and said reflective optical component,

sandwiching an air layer between the phase difference optical component and said first planar optical surface or said reflective optical component, said phase difference optical component transforming the state of polarization of said image light;

said prism guiding said image light, incident on and proceeding into said prism from said incident optical surface, up to said reflective transmitting surface, as said image light undergoes internal total reflection on said first planar optical surface and on said second planar optical surface, an intermediate image of said image being formed in the course of the guiding of said image light.

2. The image display apparatus according to claim 1 wherein a virtual-image optical system of the image display apparatus, including said prism, said reflective transmitting surface of said prism, said reflective optical component and the phase difference optical component, is a coaxial optical system with the optical axes of optical surfaces all being coincident with one another.

3. The image display apparatus according to claim 2 wherein an angle A defined between said optical axis of said incident planar optical surface and a normal to said first planar optical surface or a normal to said second planar optical surface and an angle C defined between said reflective transmitting surface of said prism and said first planar optical surface satisfy the following equation (1)

$$A = 2C \quad (1).$$

4. The image display apparatus according to claim 1 wherein said reflective optical component is a concave mirror arranged on a side towards said first planar optical surface so that a concave reflective surface is directed to said optical pupil.

5. The image display apparatus according to claim 1 wherein said reflective optical component is a holographic optical component arranged on a side towards said first planar optical surface so that a holographic surface thereof directs to said optical pupil.

6. An image display apparatus comprising

an image display device for demonstrating an image;

a relaying optical system for relaying image light of said image demonstrated on said image display device;

a prism at least including a first planar optical surface, a second planar optical surface arranged substantially parallel to said first planar optical surface on a side towards an optical pupil, an incident optical surface which has an optical axis including an angle of not less than 30 degrees and less than 90 degrees with a normal to said first planar optical surface or to a normal to said second planar optical surface and on which is incident said image light relayed by said relaying optical system, and a reflective transmitting surface having a preset tilt relative to said first planar optical surface or said second planar optical surface and adapted for reflecting or transmitting said image light incident thereon from said incident optical surface;

a reflective optical component arranged on a side towards said first planar optical surface of said prism and configured for reflecting said image light, reflected on said reflective transmitting surface and radiated from said first planar optical surface towards said reflective transmitting surface, as a substantially collimated light beam; and

a phase difference optical component arranged on a light path of said first planar optical surface of said prism and said reflective optical component, sandwiching an air layer between the phase difference optical component and said first planar optical surface or said reflective optical component, said phase difference optical component transforming the state of polarization of said image light;

said prism guiding said image light, incident on and proceeding into said prism from said incident optical surface, up to said reflective transmitting surface, as said image light undergoes internal total reflection on said first planar optical surface.

7. The image display apparatus according to claim 6 wherein a virtual-image optical system of the image display apparatus, including said prism, said reflective transmitting surface of said prism, said reflective optical component and the phase difference optical component is a coaxial optical system with the optical axes of optical surfaces all being coincident with one another.

8. The image display apparatus according to claim 7 wherein an angle  $A$  defined

between said optical axis of said incident optical surface and a normal to said first planar optical surface or a normal to said second planar optical surface and an angle C defined between said reflective transmitting surface of said prism and said first planar optical surface satisfy the following equation (1)

$$A = 2C \quad (1).$$

9. The image display apparatus according to claim 6 wherein said reflective optical component is a concave mirror arranged on a side towards said first planar optical surface so that a concave reflective surface is directed to said optical pupil.

10. The image display apparatus according to claim 6 wherein said reflective optical component is a holographic optical component arranged on a side towards said first planar optical surface so that a holographic surface thereof directs to said optical pupil.

11. An image display apparatus comprising

- an image display device for demonstrating an image;
- a relaying optical system for relaying image light of said image demonstrated on said image display device;
- a prism at least including a first curved optical surface, a second curved optical surface arranged substantially parallel to said first curved optical surface on a side towards an optical pupil, an incident optical surface on which is incident said image light relayed by said relaying optical system, and a reflective transmitting surface having a preset tilt relative to said first curved optical surface and said

second curved optical surface and adapted for reflecting or transmitting said image light incident thereon from said incident optical surface;

a reflective optical component arranged on a side towards said first curved optical surface of said prism and configured for reflecting said image light reflected on said reflective transmitting surface and radiated from said first curved optical surface towards said reflective transmitting surface as a substantially collimated light beam; and

a phase difference optical component arranged on a light path of said first curved optical surface of said prism and said reflective optical component, sandwiching an air layer between the phase difference optical component and said first curved optical surface or said reflective optical component, said phase difference optical component transforming the state of polarization of said image light;

said prism guiding said image light, incident on and proceeding into said prism from said incident optical surface, up to said reflective transmitting surface, as said image light undergoes internal total reflection on said first curved optical surface and on said second curved optical surface, an intermediate image of said image being formed in the course of the guiding of said image light.

12. The image display apparatus according to claim 11 wherein said reflective optical component is a concave mirror arranged on a side towards said first curved optical surface so that a concave reflective surface is directed to said optical pupil.

13. The image display apparatus according to claim 11 wherein said reflective optical component is a reflective holographic optical component arranged on a side towards said first curved optical surface so that a holographic surface thereof directs to said optical pupil.

14. An image display apparatus comprising

an image display device for demonstrating an image;

a relaying optical system for relaying image light of said image demonstrated on said image display device;

a prism at least including a first curved optical surface, a second curved optical surface arranged substantially parallel to said first curved optical surface on a side towards an optical pupil, an incident optical surface on which is incident said image light relayed by said relaying optical system, and a reflective transmitting surface having a preset tilt relative to said first curved optical surface and said second curved optical surface and adapted for reflecting or transmitting said image light incident thereon from said incident curved optical surface;

a reflective optical component arranged on a side towards said first curved optical surface of said prism and configured for reflecting said image light reflected on said reflective transmitting surface and radiated from said first curved optical surface towards said reflective transmitting surface as a substantially collimated light beam; and

a phase difference optical component arranged on a light path of said first

curved optical surface of said prism and said reflective optical component, sandwiching an air layer between the phase difference optical component and said first curved optical surface or said reflective optical component, said phase difference optical component transforming the state of polarization of said image light;

said prism guiding said image light, incident on and proceeding into said prism from said incident optical surface, up to said reflective transmitting surface, as said image light undergoes internal total reflection on said first curved optical surface.

15. The image display apparatus according to claim 14 wherein said reflective optical component is a concave mirror arranged on a side towards said first curved optical surface so that a concave reflective surface is directed to said optical pupil.

16. The image display apparatus according to claim 14 wherein said reflective optical component is a reflective holographic optical component arranged on a side towards said first curved optical surface so that a holographic surface thereof directs to said optical pupil.